

AMENDMENTS TO THE SPECIFICATION:

On Page 2, line 30, please replace the equation [1] with the following:

$$\text{Eq. } k \cdot \Delta A \cdot Q_3 = k \cdot \lambda / L \quad [1]$$

On Page 2, line 32 to Page 3, line 9, please replace the current paragraphs with the following:

- Q_3 is the aperture of the main lobe of the antenna at -3dB,
- λ is the wavelength of the acoustic wave given by $\lambda = c/f$, where c represents the propagation speed of the wave in the medium considered (sea water or fresh water for example) and f the frequency of the acoustic wave,
- L is the length of the antenna,
- K is a coefficient in particular related to the form of the antenna and to the weighting function used for the lobes. k can in particular take a value lying between 0.9 and 1.5.

Relation [1] demonstrates that Q_3 is dependent on the frequency of the transmitted wave, as well as the length of the antenna.

On page 3, lines 15-23, please replace the current paragraph with the following:

Satisfying the accuracy requirement prompts one to choose, in accordance with relation [1], a relatively high emission frequency associated with an antenna of large size. However, it is known that the absorption coefficient of acoustic waves is dependent on the frequency of the transmitted wave or more precisely on the inverse of the square of the frequency. Stated otherwise, the higher the ~~emission-transmission~~ frequency ~~is~~ and the more ~~limited~~ the range ~~is limited~~, the transmitted power being ~~moreover otherwise~~ constant. The range requirement therefore leads to a choice of emission at relatively low frequency. The duality of these two requirements culminates finally in the search for a compromise.

On page 3, line 25 to Page 4, line 5, please replace the current paragraph with the following:

In the particular case of a multihull ship, the compromise turns out to be more difficult to find than for a conventional ship. The hydrodynamic constraints of such craft make it essential in particular to reduce anything that may affect the drag of the hulls and in particular the size of the antennas. The slenderness of the floats does not furthermore make it possible to have available an antenna of satisfactory size to ensure the desired directivity. It is possible nevertheless to alleviate this handicap by using a system of antennas of low dimensions comprising for example, at emission or at reception, two or more antennas. Each antenna can be placed on a distinct hull. An array ~~of antennas~~ ~~antenna~~ is thus produced. It is necessary however in this case to take into account the occurrence, in addition to the main lobe, of spurious image lobes. These spurious lobes also called array lobes are induced by the distance which separates the floats on which the antennas are disposed. This spacing, very large compared with the wavelength of the acoustic signal, leads to a spatial undersampling of the received signal which induces the occurrence of the array lobes. The result is the existence of an ambiguity as to the direction of arrival of the signal back-scattered by a floating object.

On page 4, line 18, please replace the equation [2] with the following:

$$\frac{I_{\text{received}}}{I_{\text{transmitted}}} = (1 + (2/c) \cdot v_{\text{ship}} \cdot \cos\theta) \cdot \frac{I_{\text{received}}}{I_{\text{transmitted}}} = (1 + (2/c) \cdot v_{\text{ship}} \cdot \cos\theta) \quad [2]$$

On page 6, please replace the section titled “Brief Description of the Drawings” with the following:

Other characteristics and advantages shall appear through the description and Figures 2 to 6 ~~1 to 5~~, which represent:

~~Figure 1, a diagrammatic representation of the device according to one of the embodiments of the present invention installed at the bow of a ship;~~

~~Figure 2, a diagrammatic representation of the device according to the invention installed at the bow of a ship with two hulls;~~

~~Figure 3, a diagram illustrating the principle of operation of the device according~~

to the invention.

Figure 4, a diagram illustrating the steps of an exemplary method that can be implemented by the device according to the invention so as to determine the position of an object.

Figure 5, an illustration of a particular exemplary use of the device according to the invention.

On page 10, lines 20-22, please replace the equation [10], [11] and [12] with the following:

$$D_1^2 \# (X + V \cdot T_1)^2 + Y^2 \quad D_1^2 \approx (X + V \cdot T_1)^2 + Y^2 \quad [10]$$

$$D_2^2 \# (X + V \cdot T_2)^2 + (A - Y)^2 \quad D_2^2 \approx (X + V \cdot T_2)^2 + (A - Y)^2 \quad [11]$$

$$D_0^2 = X^2 + Y^2 \# D_0^2 \quad D_0^2 = X^2 + Y^2 \approx D_0^2 \quad [12]$$

On page 12, line 21, please replace the equation [13] with the following:

$$F_{r1} \# F_1[1 + V/C.(\cos \theta_1 + \cos \theta_0)] \quad F_{r1} \approx F_1[1 + V/C.(\cos \theta_1 + \cos \theta_0)] \quad [13]$$

On page 12, line 23, please replace the equation [13] with the following:

$$F_{r2} \# F_2[1 + V/C.(\cos \theta_2 + \cos \theta_0)] \quad F_{r2} \approx F_2[1 + V/C.(\cos \theta_2 + \cos \theta_0)] \quad [14]$$

On page 10, lines 26-31, please replace the current paragraph with the following:

In a graphical manner these coordinates X and Y determine the intersection of two ellipses. One of the ellipses corresponds to the location with respect to the receiver of the points for which the propagation time of a wave transmitted by the transmitter 1 corresponds to T_1 . The other ellipse corresponds to the location with respect to the receiver of the points for which the propagation time of a wave transmitted by the transmitter 2 corresponds to T_2 .

On page 12, lines 28-30, please replace the current paragraph with the following:

The frequency shifts between ~~Transmitted-transmitted~~ and received signals are related to the speed of the ship which causes the relative position of the ship with respect to the object to vary.

On page 12, lines 32-35, please replace the current paragraph with the following:

If the differential delay ~~(T2-T1)-(T2-T1)~~ corresponding to the time deviation separating the instants of reception of the echos originating from the object is compensated and if the intercorrelation of the received signals corresponding to the same instant of emission is performed, we obtain a signal of the form:

On page 14, lines 5-9, please replace the current paragraph with the following:

The differential Doppler frequency, ~~Image-Image~~ of the speed V, appears as being dependent on the angles θ_0 , θ'_0 , θ_1 and θ_2 . It is hence possible by determining the value of the differential Doppler frequency Δf_d , to determine θ_0 , θ'_0 , θ_1 and θ_2 , and hence to determine the coordinates X and Y of the object 27 having returned an echo. This determination can be done by any known procedure.

On page 15, lines 33 to page 16, line 9, please replace the current paragraph with the following:

The signals obtained thereafter form the subject of operations 412 of frequency analysis whose aim is in particular to determine for each intercorrelation result the values Δf_r for which a signal is detected. The level of the spectral component arising from each analysis can form the subject, as mentioned in the figure, of a comparison 413 with a detection threshold. The corresponding values $[[\Delta f_r]]$ ~~Δf_r~~ gives rise to the operation 414 for determining the position of the detected object. This operation consists for example in calculating the coordinates X and Y of the object by taking into account the speed V of the ship, V being determined on the basis of Δf_r according to a known procedure. These coordinates give rise to a utilization 415. The latter can consist of a display on a console for an operator thus able to decide the threat that the object represents or of a use by a monitoring and automatic avoidance device.